Guidelines for exporting treatment plan data for clinical trial QA reviews

Brainlab iPlan 4.5
Eclipse 11
Monaco 5
Oncentra 4.3
Pinnacle 9.6 and 9.8
RayStation 4
Tomotherapy 5
Xio 5

Version 8
March 2015

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ABBREVIATIONS & GLOSSARY

ATC	Advanced Technology Consortium
CT	Computed Tomography
CQMS	Central Quality Management System
DICOM	Digital Communications in Medicine
DRR	Digitally Reconstructed Radiograph
DVH	Dose Volume Histogram
GCP	Good Clinical Practice
MRI	Magnetic Resonance Imaging
OAR	Organs at Risk
PET	Positron Emission Tomography
PTV	Planning Target Volume
RTOG	Radiation Therapy Oncology Group (USA)
TCOO	TROG Central Operations Office
TMC	Trial Management Committee
TPS	Treatment Planning System
QA	Quality Assurance
UID	DICOM Unique Identifier

CHANGES IN THIS VERSION

Section	Change	Notes
1.1	Scope of data	Update: ICRU reference point no longer required
1.2	Format of data	DICOM format only
2.2	De-identification	Not required by centre. Automatic de-identification at point of upload to CQMS
3	Software version	All TPS manufacturers confirmed information for latest software versions
3.6	RayStation	Information included

1. TROG GUIDELINES FOR PLAN AND TREATMENT DATA EXPORT

1.1 SCOPE

TROG QA reviews require information on treatment plan, often for pre-treatment review, and on delivery of the course. The information required is given below.

Treatment plan data

From the treatment planning system:

- Planning CT series
- Diagnostic imaging such as MRI and/or PET used for target volume delineation
- Structure set
- Plan – may have several phases
- Dose grid for each phase
- DVH data if available
- Treatment plan report
- Screendump showing transverse, sagittal and coronal planes, structures and isodoses through the centre of target volume

These items are required for each trial. Specific trials may require additional information which will be specified in the QA Checklist.

1.2 FORMAT OF EXPORTED DATA

The primary standard for data export is DICOM, supported by all planning systems. TROG plan review software will only accept DICOM format.

If DICOM export is not available on your planning system, please contact TROG QA qa@trog.com.au .

2. THE EXPORT PROCESS

2.1 PREPARATION FOR EXPORT

Figure 2.1 demonstrates the schematic process for preparing a radiotherapy plan for export to TROG.

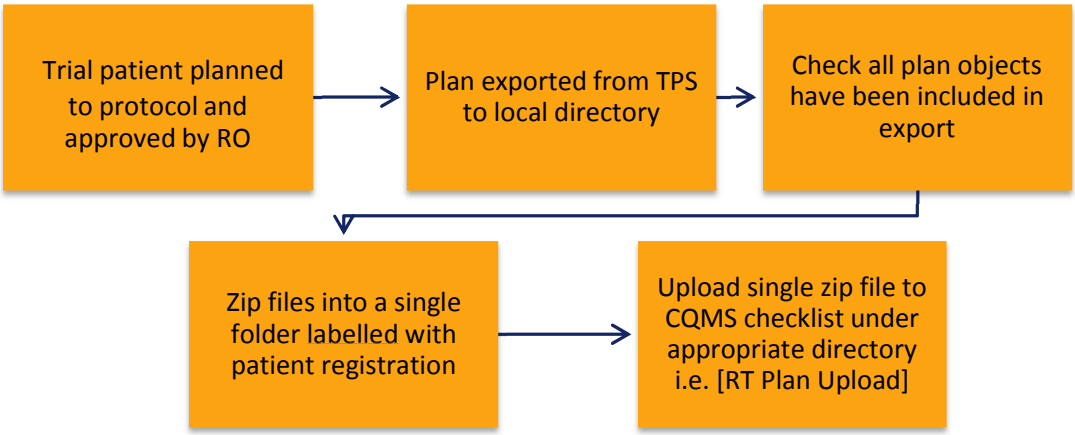

Trial patient planned to protocol and approved by RO
Plan exported from TPS to local directory
Check all plan objects have been included in export
Zip files into a single folder labelled with patient registration
Upload single zip file to CQMS checklist under appropriate directory i.e. [RT Plan Upload]

Figure 2.1: Plan export process

2.2 DE-IDENTIFICATION OF RADIOTHERAPY DATA

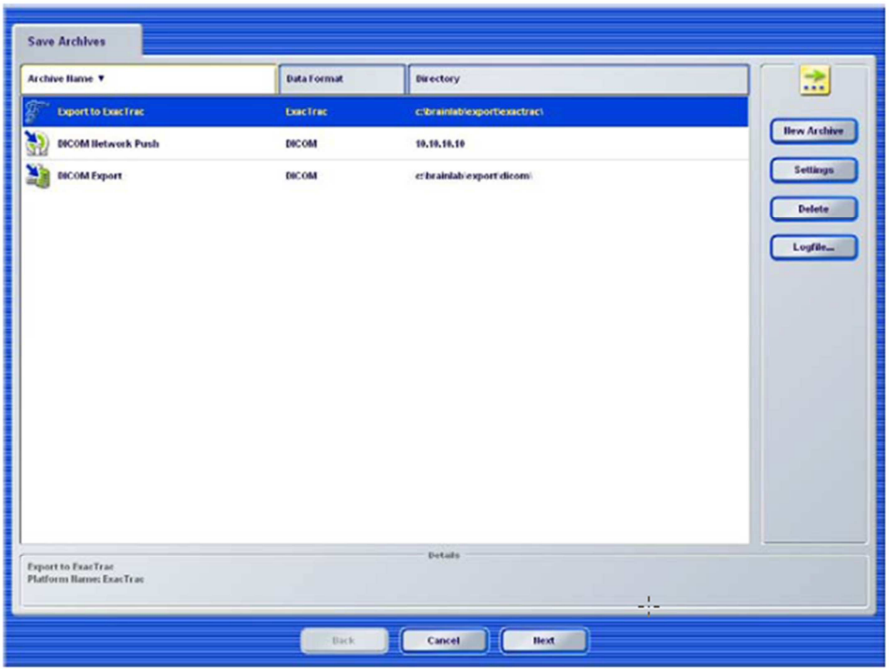
De-identifying software has now been built into CQMS at the point of upload. For each DICOM file, the patient name and ID are replaced with the trial number and patient reference number, and the sex is replaced with O (for other). The date of birth is replaced with the date of upload. The programming follows the recommendations in DICOM Standards, Supplement 142 “Clinical Trial De-identification Profiles”.

As a result, there is no longer any need to anonymise the patient data before exporting: the process is automatic. This only applies to DICOM data exported from treatment planning systems; all other data, such as screendumps, will need to be de-identified as before.

3. EXPORTING FROM TREATMENT PLANNING SYSTEMS

3.1 BRAINLAB IPLAN VN 4.5

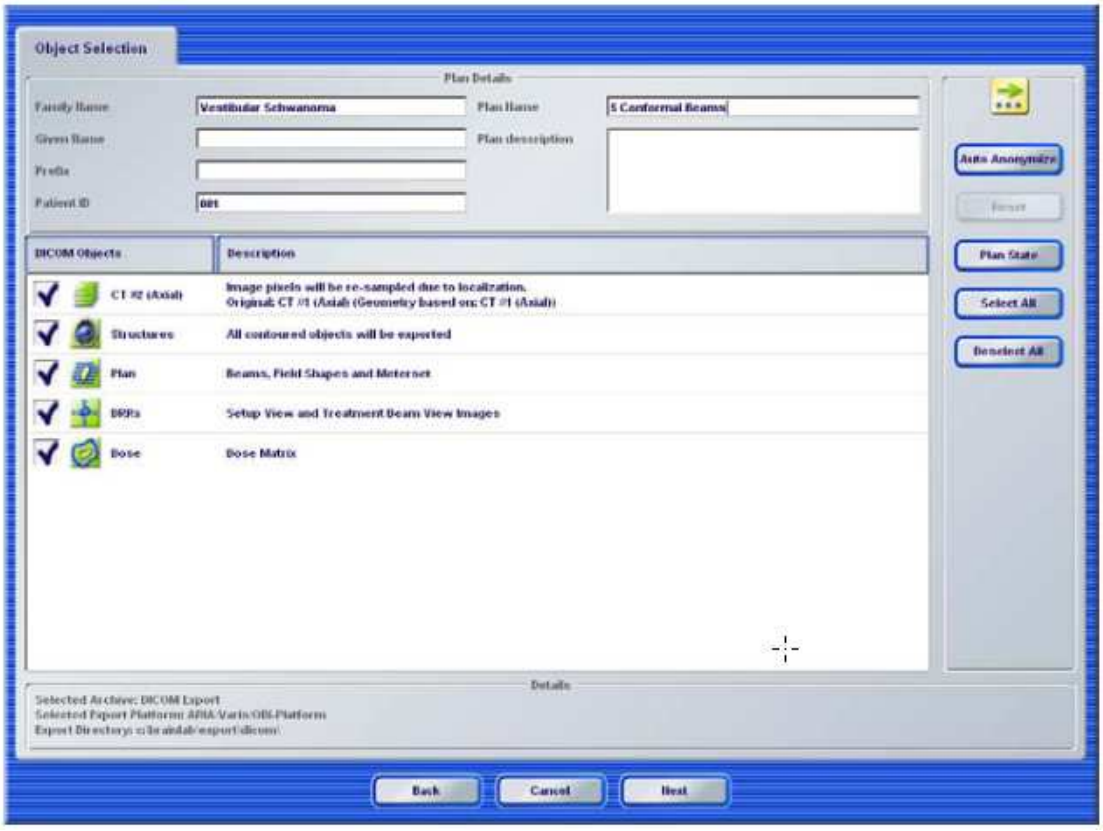
1. Under Physicist's verification, select Export, then Export wizard.
2. Select the appropriate DICOM Archive to export the TROG information (i.e DICOM Export or a specific TROG Archive if available).
3. The Brainlab engineer normally sets up an export archive to the R&V system (either by saving it in a shared directory or DICOM push). TROG would suggest:
    a. Creating a new export archive called "TROG Export", which then would be the selection instead of "DICOM Export". This export will then be to a special directory eg. C:\brainlab\export\TROG\
    b. For the archive's properties, edit the path to save the data to (default is C:\brainlab\export\dicom\). This shared path (i.e. C:\Brainlab\export\TROG) should be accessible for all users to zip and upload the data onto the TROG website.



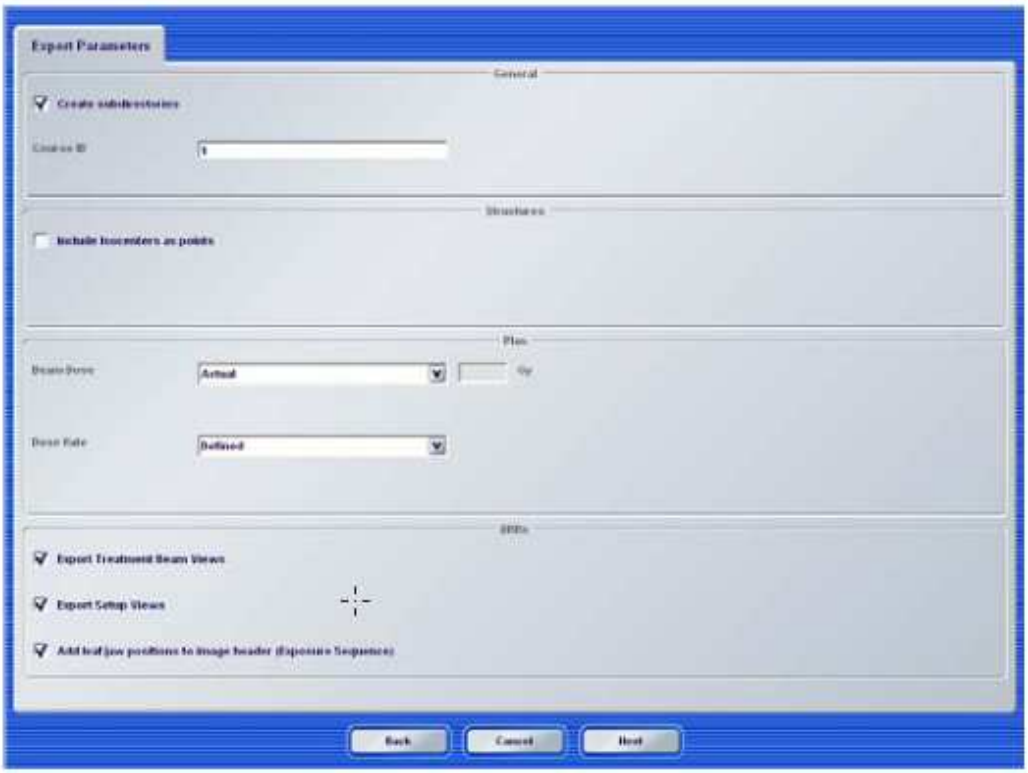
4. Select Next.
5. Plan approval – any errors will be displayed, eg lack of plan approval, inconsistent data. Warning box will be displayed.

Plan Status
Originator
Message Type
Message
Group Conform Arc Dyna - Dyn. Arc 3
Error
The MU per degree value is below the machine's limit. Please check!
Group Conform Arc Dyna - Dyn. Arc 2
Error
The MU per degree value is below the machine's limit. Please check!
Group Conform Arc Dyna - Dyn. Arc 1
Error
The MU per degree value is below the machine's limit. Please check!
Close

6. Press Close to continue.
7. Object selection. Click on the "Auto Anonymise" button on the top-right corner in the object selection dialogue box to anonymise the patient data. On right panel, Select All.

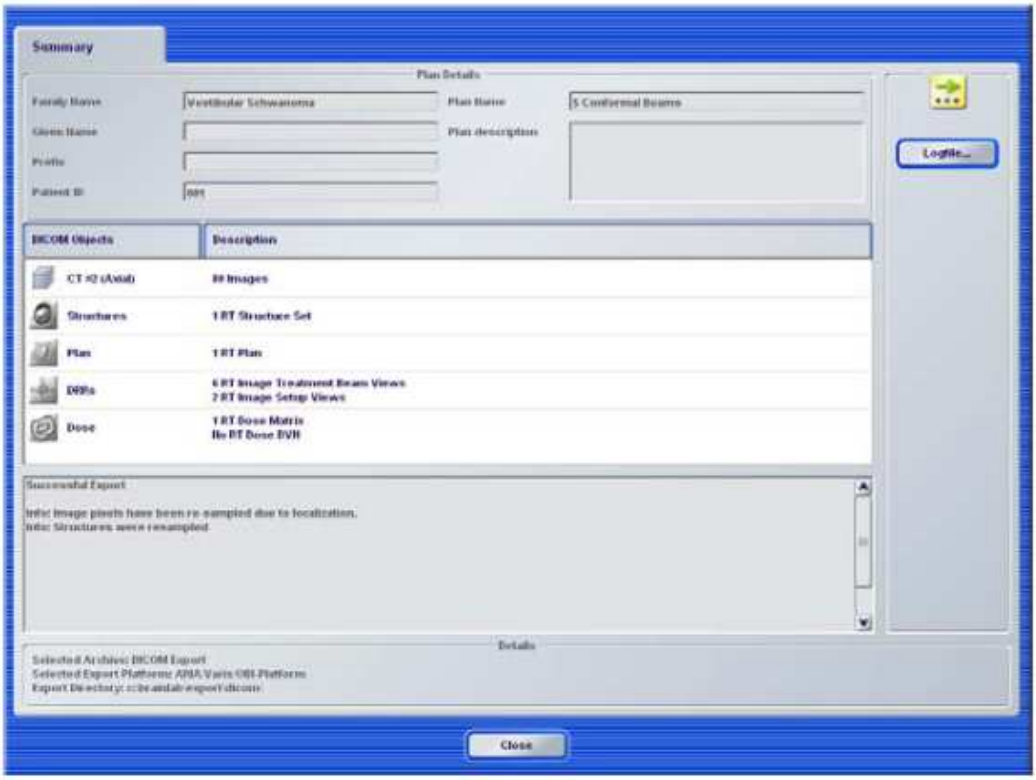


8. Export parameters. Tick Create subdirectories, Export treatment beam views and Add leaf jaw positions.



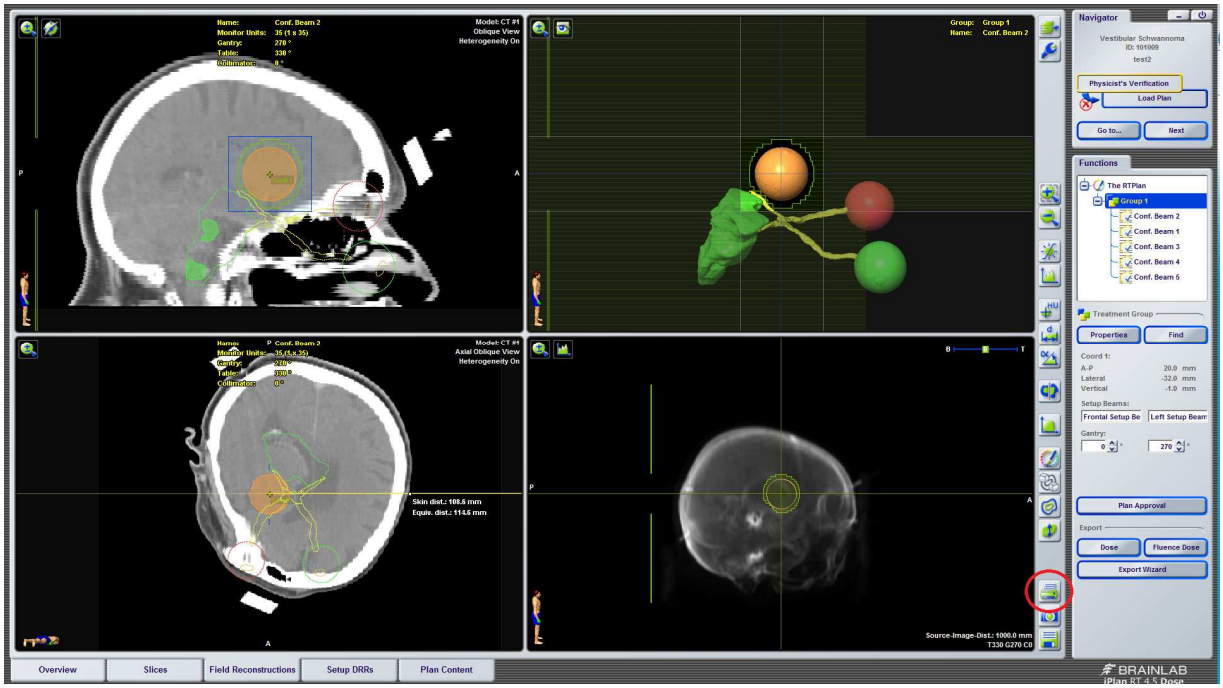
9. Dose export dialogue. Select dose for entire plan; DVHs for all objects.

10. Export summary. Successful export message is displayed in lower half.

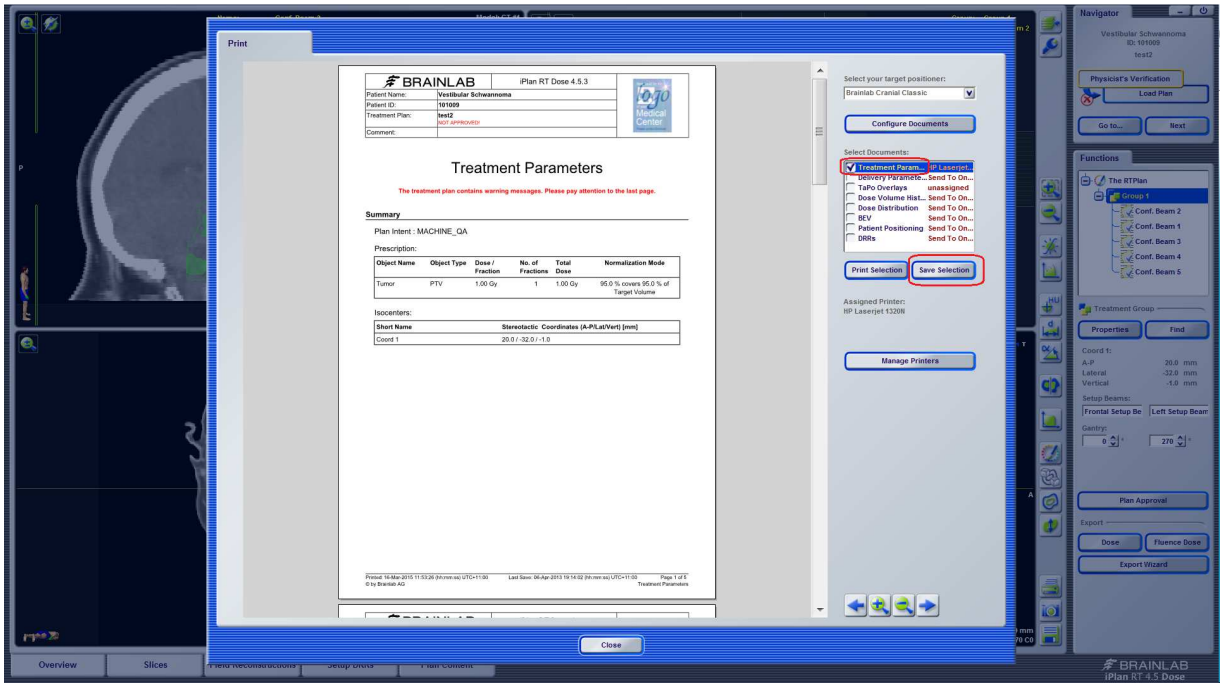


11. Export treatment report in pdf format.

    i. Go to the “Physicist Verification “ section in iPlan RT Dose, click on the print button, circled in red at bottom right



ii. Select “treatment parameters” and “save as”, as shown below. This will allow user to save in pdf format.



Acknowledgements: BrainLab for iPlan 4.5 reference manual, pp 433 -451

Michael Ruemelin and Eric Orpilla, BrainLab

3.2 ECLIPSE VN 11

Exporting Multi phase plans using the same CT scan set

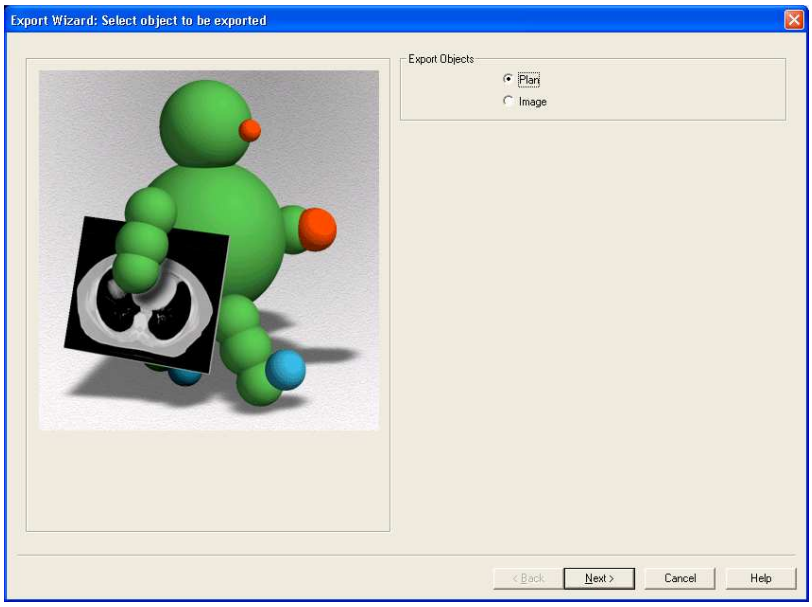
- Create a new PlanSum by adding the phase 1 and phase 2 and…. plans.
- Drag the PlanSum into the active area.
- Follow export instructions found below to export the plans in the PlanSum.

1. Open the export dialogue

a. Select File/Export/Wizard……

Do NOT use ATC Dicom export as this sets the dose file type to a value which cannot be read by the plan review software.

b. Select **Plan** (or All plans in PlanSum) radio button, then click **Next**

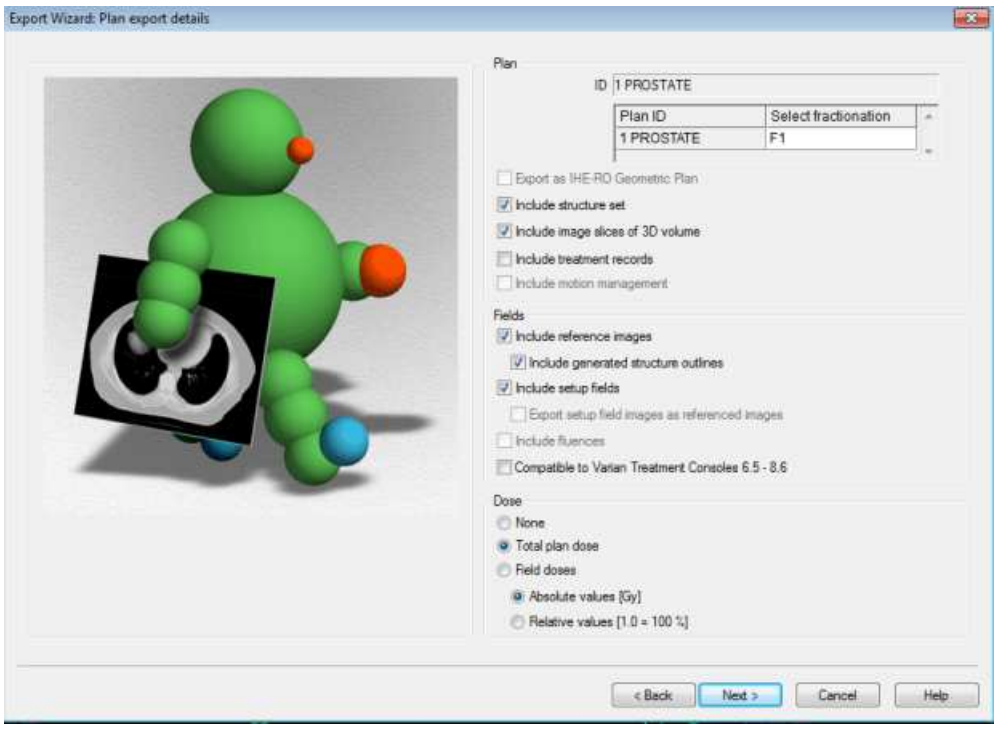


2. Check the plan export details

There are six components to include in the export (screenshot below):

1. The CT image set, including the 3D volume image

2. The structure set, containing all the contours
3. The DRR for each field (Eclipse terminology is “reference image”)
4. The treatment plan, including all field parameters and MLC shapes
5. The dose matrix
6. The DVH for the plan (see section 3. DVH export details)



Plan

- Select the plan and fractionation to export. This will default to the plan which was open when the export wizard was opened.
- Check the button to include the structure set
- Check the button to include image slices of 3D volume

Fields

- Select “include reference images” and “include generated structure outlines”

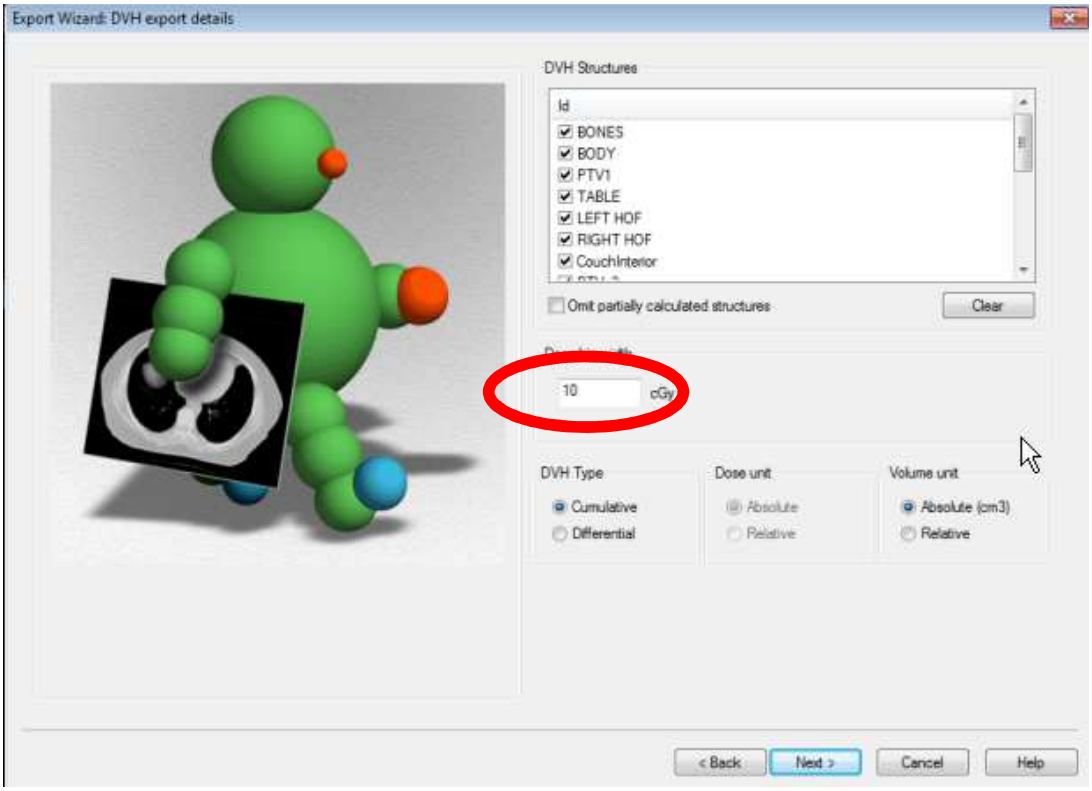
- Select “include setup fields” and “export setup images as referenced images”
- do not select “compatible to Varian treatment console”

Dose

- Select Total plan dose
- Select Absolute values (Gy)

Click **Next**

3. Check the DVH export details



a) Select the structures for which a DVH is required

- CTV, and also CTV2 if this is a 2 phase treatment
- PTV, and also PTV2 if this is a 2 phase treatment
- Organs outlined, which will depend on site and will be specified in the trial protocol

b) Select "Omit partially calculated structures"

c) Set the dose bin width to 0.10Gy [or 10cGy]

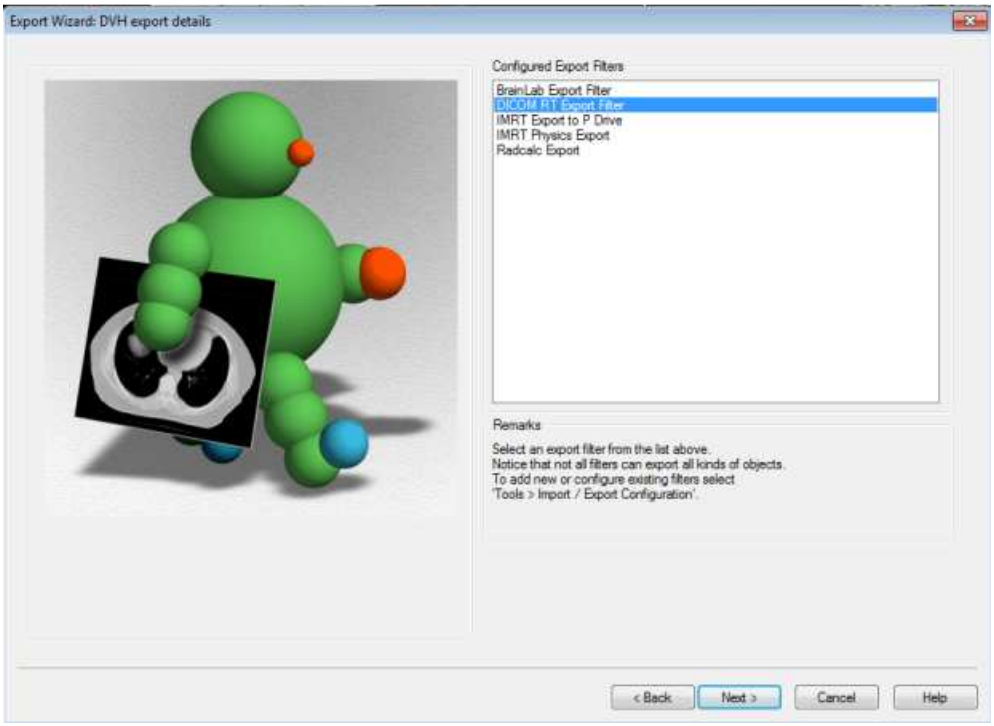
d) Set the DVH type to Cumulative

e) Set the volume unit to Absolute (cm^3)

f) Select **Next**

4. Select the appropriate export filter

The default filter set up by Varian is the "Dicom Media File Export Filter". This may be customised by the local system administrator in the Import/Export filter set up as a TROG export filter, pointing to the directory for export and renamed to reflect this.


Export Wizard: DVH export details
Configured Export Filters
BrainLab Export Filter
DICOM RT Export Filter
IMRT Export to P Drive
IMRT Physics Export
Radcalc Export
Remarks
Select an export filter from the list above.
Notice that not all filters can export all kinds of objects.
To add new or configure existing filters select
'Tools > Import / Export Configuration'.
< Back
Next >
Cancel
Help

5. Eclipse export filter continued

Each patient should have their own directory.

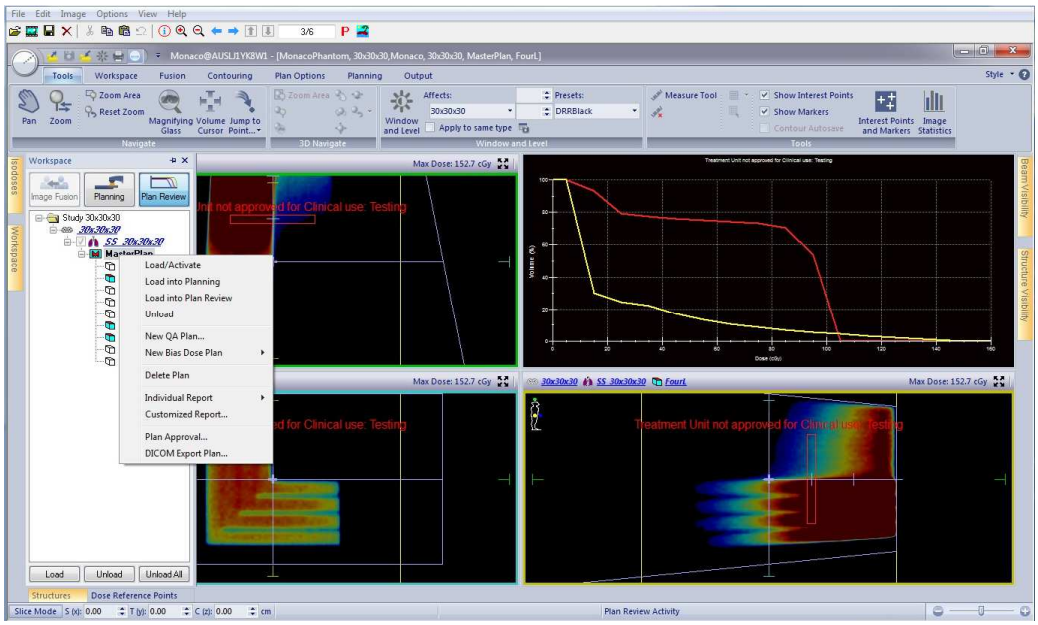
To navigate to a different directory, or create a new directory for this patient, select “Change for all objects” which leads to the Windows explorer window. You can then browse to the exact location for export or create a new directory.

Select “Finish” to export the files.

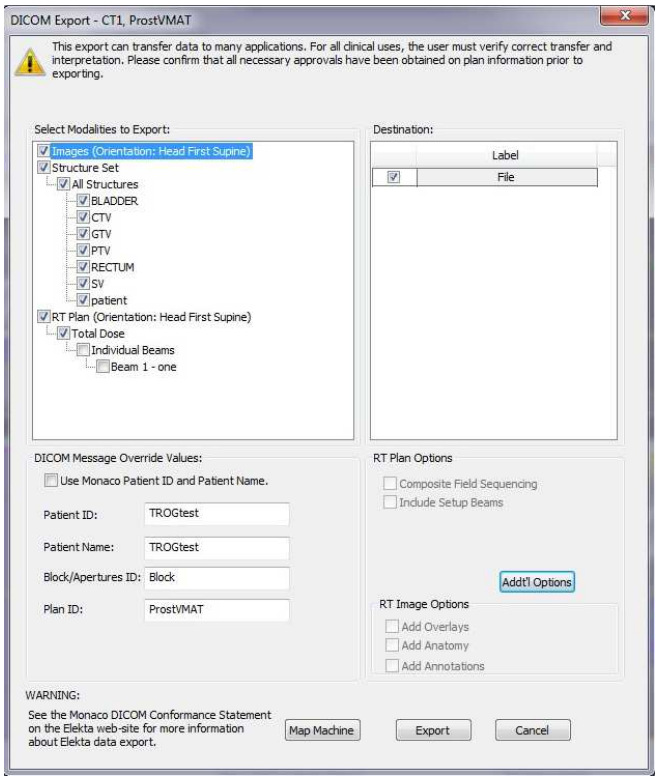
Acknowledgements: Sean Watson, Varian

3.3 MONACO VN 5

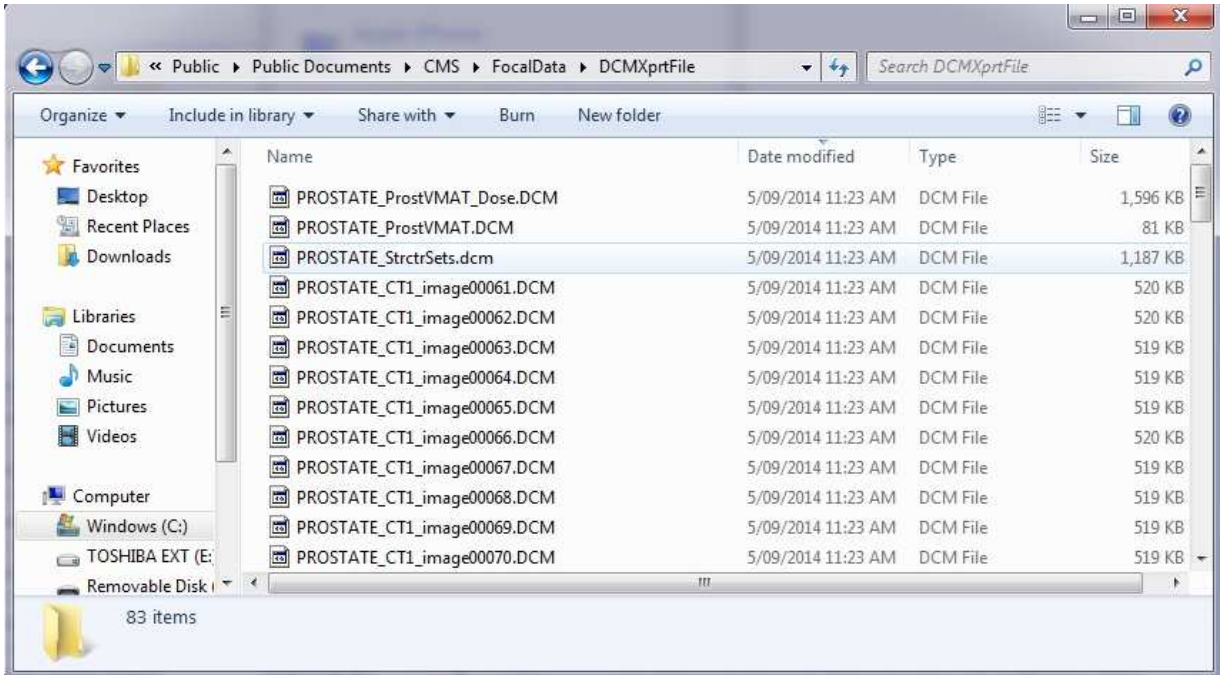
1. Select plan, R click on plan and select Dicom export plan



Select export options



Once the export completes, use windows explorer to find the Focal file location which will end in …..\FocalData\DCMXprtFile.

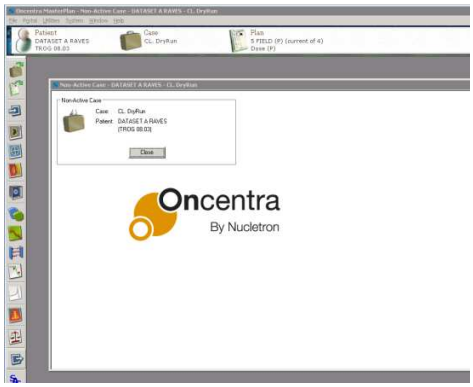

« Public ▸ Public Documents ▸ CMS ▸ FocalData ▸ DCMXprtFile
Search DCMXprtFile
Organize
Include in library
Share with
Burn
New folder
Favorites
Desktop
Recent Places
Downloads
Libraries
Documents
Music
Pictures
Videos
Computer
Windows (C:)
TOSHIBA EXT (E:
Removable Disk
Name
Date modified
Type
Size
PROSTATE_ProstVMAT_Dose.DCM 5/09/2014 11:23 AM DCM File 1,596 KB
PROSTATE_ProstVMAT.DCM 5/09/2014 11:23 AM DCM File 81 KB
PROSTATE_StrctrSets.dcm 5/09/2014 11:23 AM DCM File 1,187 KB
PROSTATE_CT1_image00061.DCM 5/09/2014 11:23 AM DCM File 520 KB
PROSTATE_CT1_image00062.DCM 5/09/2014 11:23 AM DCM File 520 KB
PROSTATE_CT1_image00063.DCM 5/09/2014 11:23 AM DCM File 519 KB
PROSTATE_CT1_image00064.DCM 5/09/2014 11:23 AM DCM File 519 KB
PROSTATE_CT1_image00065.DCM 5/09/2014 11:23 AM DCM File 519 KB
PROSTATE_CT1_image00066.DCM 5/09/2014 11:23 AM DCM File 520 KB
PROSTATE_CT1_image00067.DCM 5/09/2014 11:23 AM DCM File 519 KB
PROSTATE_CT1_image00068.DCM 5/09/2014 11:23 AM DCM File 519 KB
PROSTATE_CT1_image00069.DCM 5/09/2014 11:23 AM DCM File 519 KB
PROSTATE_CT1_image00070.DCM 5/09/2014 11:23 AM DCM File 519 KB
83 items

2. Copy the files to a temporary location on your PC
3. Select all files, right click and send to compressed folder
4. Go to the TROG CQMS website and use their upload instructions to upload the .ZIP file.

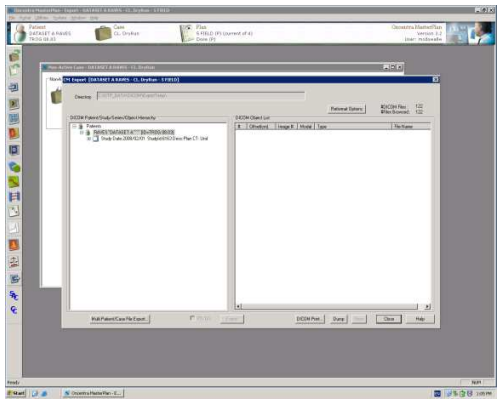
Acknowledgement: Jason Arts, Elekta

3.4 EXPORT INSTRUCTIONS FOR ONCENTRA VN 4.3

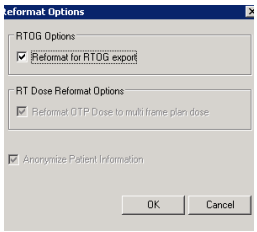
1. Open Patient File and Case in Oncentra Masterplan (OMP)
2. Select ‘Export’ (this function places the patient file in the temporary folder located on the individual terminal C:\OTP_Data\Dicom\ExportTemp)



3. Select ‘Reformat Options’ button top RT of screen

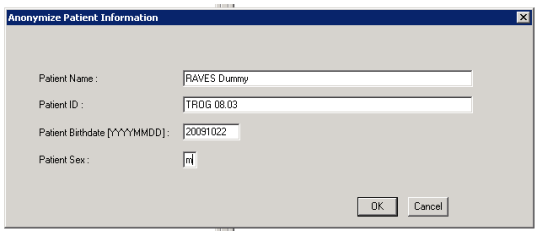


4. Select the radio button for RTOG Option-Reformat for RTOG Export, OR, RT Dose re-format option for a DICOM export.



(Note: these both combine the individual dose files for each beam to result in one RT Dose [RD] file, and also will de-identify plan). Click 'OK'.

5. The 'Anonymise Patient Information' window appears. Insert the patient initials, trial label, DOB and sex. Click 'OK'.

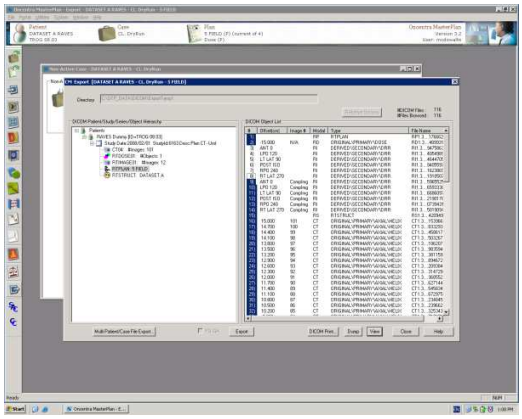


6. OTP Connectivity Module [CM] appears. Select 'YES' to use the default z positions.

   (Note: the patient details in the left hand DICOM Patient/Study/Series/Object Hierarchy box is updated to the de-identified label.)

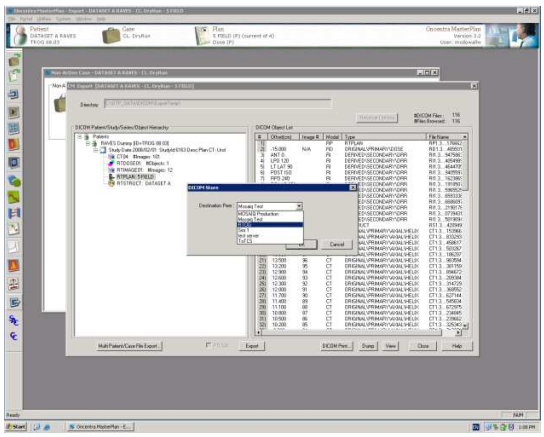
7. In the LHS (left hand screen) DICOM Hierarchy window – select the ☐ to open the study hierarchy. Select 'RT Plan'

   All patient data in RT Plan is viewed in the RHS (right hand screen) Dicom Object List, with all objects highlighted. Use CTRL+LT mouse to de-select the Image Objects (RI) for each field except for the ones labelled 'CompImg' (composite Image).



8. Select Export button at bottom of screen.

   Choose the appropriate Destination Peer from drop down menu (we have labelled ours 'RTOG'). Select 'OK' to export.



9. The RTOG or DICOM file (received by Dicom receiver on destination network PC) should contain:

RT Dose file :	RD (one only)
RT Image file :	RI (one for each beam)
RT Plan file :	RP (one only)
RT Structure set :	RS (one only)
Full CT data set :	Multiple

10. The files can now be zipped ready for export to CQMS.

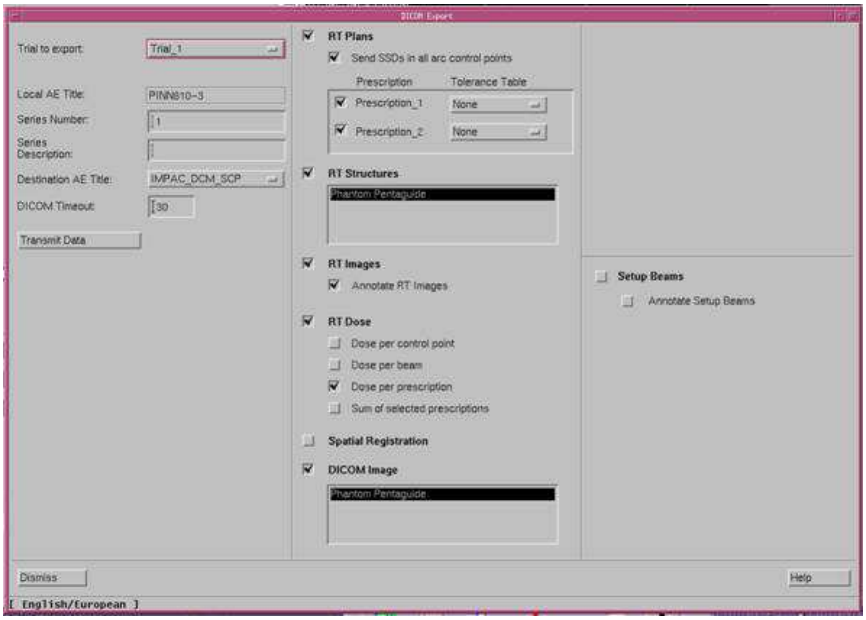
Acknowledgement: Rob McDowall and Janine Miles, Royal Brisbane and Women's Hospital

Kristen Bell, Oncentra

3.5 PINNACLE VNS 9.6 AND 9.8

1. Select File - Export - DICOM.

The DICOM Export window appears.

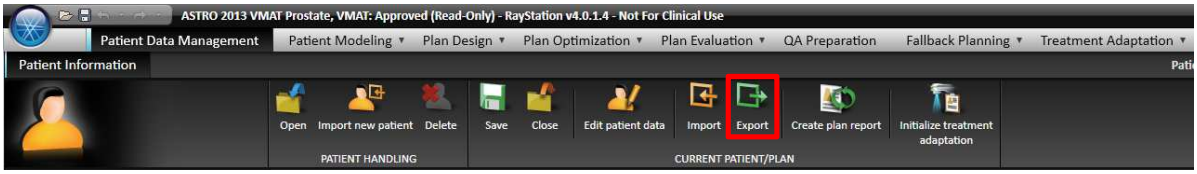


2. In the Trial to export option list, select the trial that contains the information that you want to export.
3. In the Destination AE Title option list, select the destination to which you want to export plan information. The Destination AE (Application Entity) Title list identifies the possible DICOM target systems. If no choice is available, obtain the appropriate AE title from your IT department, then contact Customer Support or your local distributor for assistance in entering it.
4. Select the information that you want to export. Note you need to select each prescription that you want to export (tick next to the phrase “Prescription_1” etc) and the correct image set under RT structures and DICOM image.
5. Click the Transmit Data button to export the information to the AE destination.
   If the export cannot be completed within the number of seconds you specify in the DICOM Timeout field, the export may fail.

Acknowledgements: John Shakeshaft, Darwin; Wendy Schumer, Insight; Pinnacle user manual, vn 9 section 15.2.2

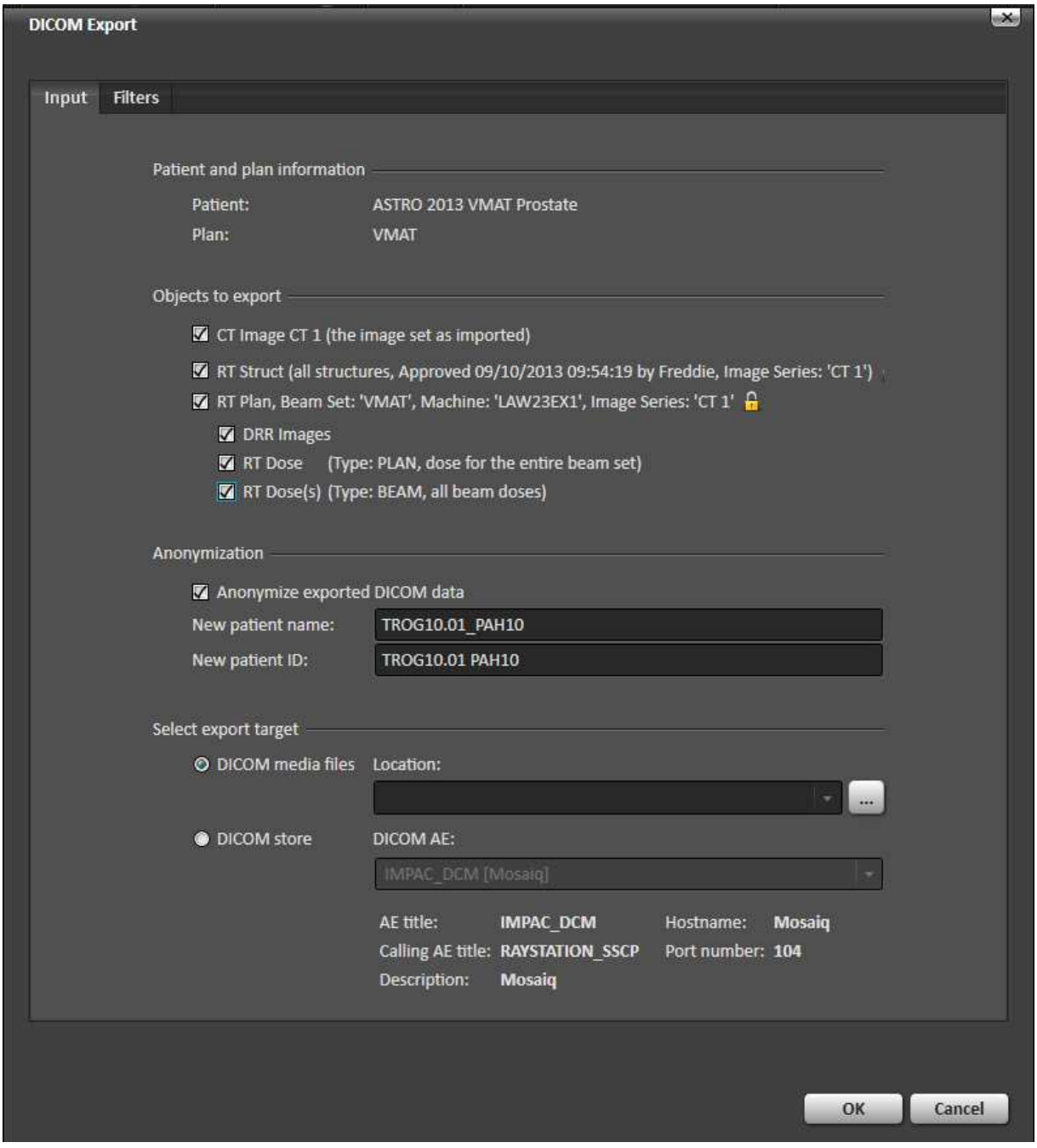
3.6 RAYSTATION VN 4.0

1. Make sure the patient and plan you wish to export is opened in RayStation
2. Open the **DICOM Export** window by choosing one of the following two options:
    a. Click on the green **Export symbol** under Patient Data Management – Patient Information.



    b. Select **DICOM Export…** from the RayStation menu in the top left corner.

3. Select **Objects to export,** by checking the corresponding checkboxes.
4. Check the checkbox to **Anonymize exported DICOM data** and change patient name and patient ID according to TROG recommendations.
5. Select **DICOM media files** as export target
6. Open a file browser by clicking the "**…**" button
7. Select target folder and click **OK**



8. Click OK in the **DICOM Export** window. A message will be displayed notifying the outcome of the export.

Acknowledgement: Terese Nordström, RaySearch Laboratories

3.7 TOMOTHERAPY 5

The user needs to export the Images, Structures, Plan and Dose from Tomotherapy in order to display a plan in plan review.

Export Items

The following items may be exported via DICOM:

- Approved plans
- Approved dose
- Plan structure sets
- Image volumes (KVCT, MVCT, and Dose Registered MVCT)

The recommended approach is to use the DQA section for exporting the data as it has more memory.

1. On the Common Frame, click the Tools button, and select DICOM options

   > Export items. The Export items via DICOM window appears.

2. Select an item to export. Ctrl + click to select multiple items.
3. From the Export to drop-down list, select the name of the export destination.

   If you want to verify the connection to the destination, click Test Connectivity.

   The Export tool attempts to establish a connection with the currently selected export destination, and information about the success or failure of the attempt appears in the DICOM communication's status area.

   NOTE: You must select a TomoImage (CTrue image in version 5) from the Image level. You cannot export an image from the Procedure level.

   NOTE: If the connection attempt fails, contact your information technology department.

4. Click Send now to begin exporting the selected image to the selected destination.

   Information about the progress of the export appears in the DICOM communication status area, and a marker appears on the Status bar of the Common Frame, indicating that an export is in progress. A green marker indicates the export is successful. A red marker indicates the image was not exported

successfully.

5. Click Close to close the Export items via DICOM window. You can close the window at any time without affecting an export in progress.
6. To check the progress of an export, click the marker on the Status Bar of the Common Frame.

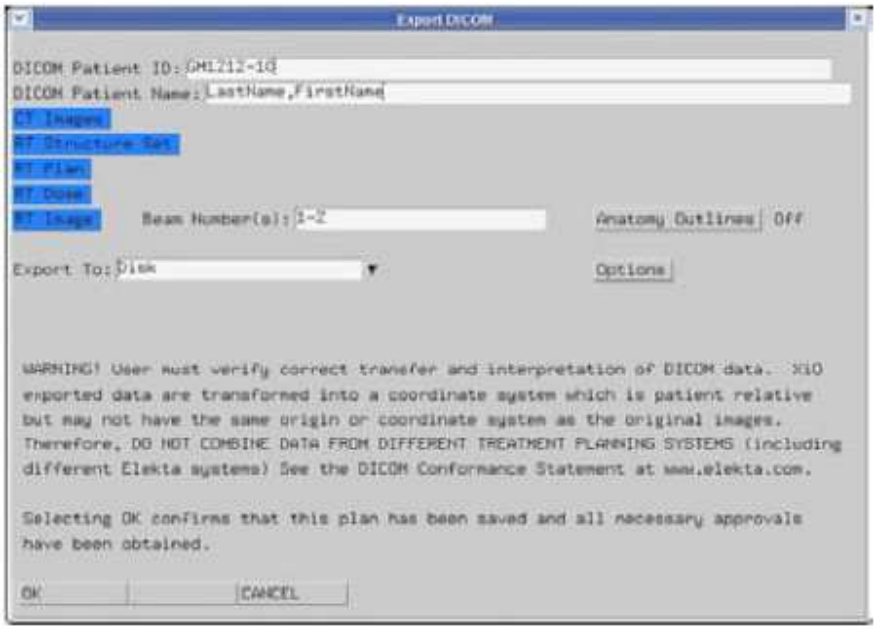
Note: The "Adaptive" scans that Tomo can now create, which are merged scans, will not associate the structures/plan/dose. This is because the original scans, that the structures etc are associated with, are now overwritten with new CT data.

Reference: Tomotherapy Users' Guide

Acknowledgements: Rob McDowall, Royal Brisbane and Women's Hospital

3.8 XIO VN 5

1. Select File, Export DICOM.
2. Select each item to export, it will be highlighted in blue.
3. Select the location of exported files. If Disk is selected as default, the files will be sent to /FOCUS/tmp/network/dicom/focus_output. Note this directory accepts all exported files. Files for a particular patient may be identified by the patient ID, or by the date and time stamp.


Export DICOM
DICOM Patient ID: GM1212-1Q
DICOM Patient Name: LastName,FirstName
CT Images
RT Structure Set
RT Plan
RT Dose
RT Image
Beam Number(s): 1-2
Anatomy Outlines Off
Export To: Disk
Options
WARNING! User must verify correct transfer and interpretation of DICOM data. XiO exported data are transformed into a coordinate system which is patient relative but may not have the same origin or coordinate system as the original images. Therefore, DO NOT COMBINE DATA FROM DIFFERENT TREATMENT PLANNING SYSTEMS (including different Elekta systems) See the DICOM Conformance Statement at www.elekta.com.
Selecting OK confirms that this plan has been saved and all necessary approvals have been obtained.
OK
CANCEL

4. Click OK to export the data.
5. Further information may be found in Xio Training Guide, Vol 1, section 8.6.

Acknowledgements: Jason Arts and David Ly, Elekta

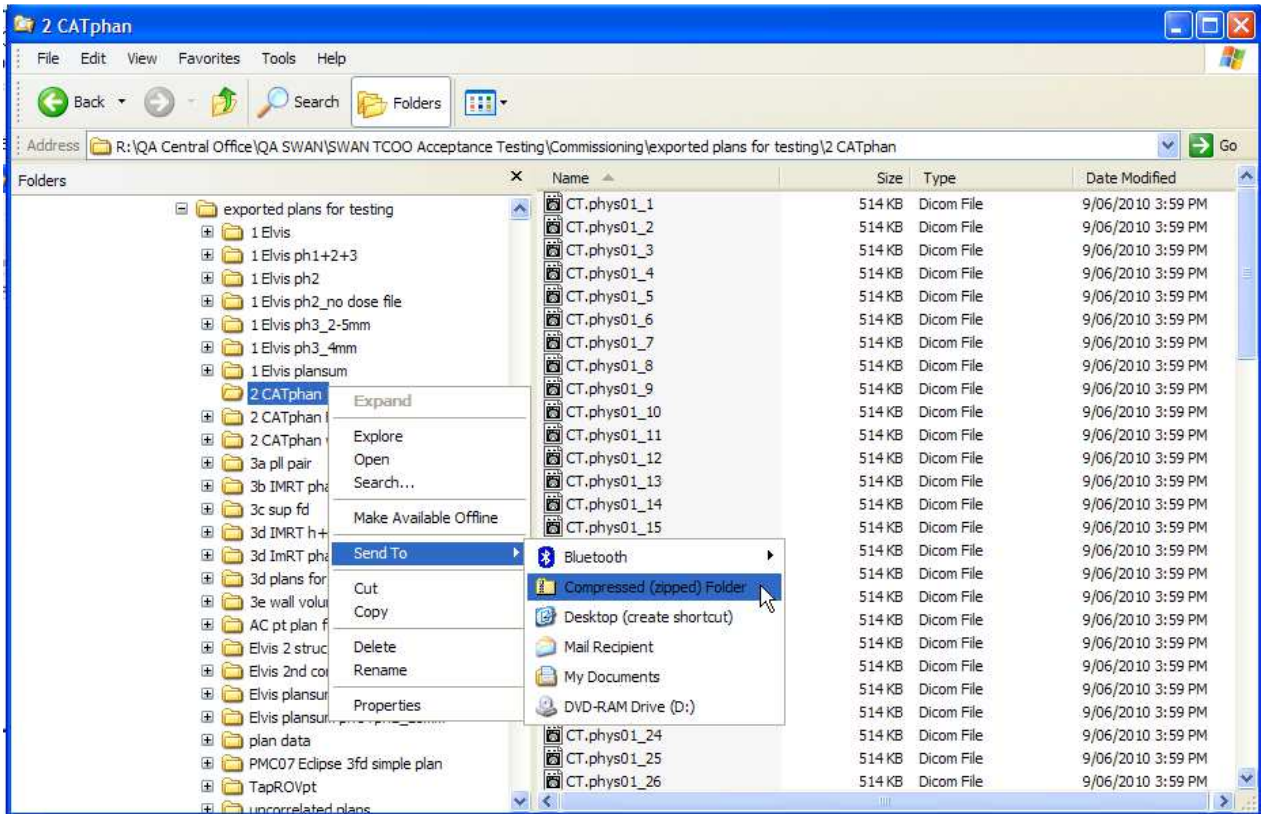
4. SUBMITTING DATA FOR REVIEW

4.1 PREPARATION OF DATA FOR UPLOAD IN CQMS

Not all file compression programs are supported by our review software. CQMS automatically extracts files from compatible programs. TROG strongly recommends Windows compressed files.

CQMS can only accept a single file. All exported plan files must be included in a single compressed (or zipped) folder. All supplementary files, for example, scanned data and screendumps, must be zipped separately for upload to CQMS.

At the Windows folder containing the exported data, right click and select *Send to…..compressed (zipped) folder*. A compressed file will be created alongside that directory.


2 CATphan
File Edit View Favorites Tools Help
Back Search Folders
Address R:\QA Central Office\QA SWAN\SWAN TCOO Acceptance Testing\Commissioning\exported plans for testing\2 CATphan
Go
Folders
exported plans for testing
1 Elvis
1 Elvis ph1+2+3
1 Elvis ph2
1 Elvis ph2_no dose file
1 Elvis ph3_2-5mm
1 Elvis ph3_4mm
1 Elvis plansum
2 CATphan
Expand
Explore
Open
Search...
Make Available Offline
Send To
Cut
Copy
Delete
Rename
Properties
Bluetooth
Compressed (zipped) Folder
Desktop (create shortcut)
Mail Recipient
My Documents
DVD-RAM Drive (D:)
plan data
PMC07 Eclipse 3fd simple plan
TapROVpt
Name Size Type Date Modified
CT.phys01_1 514 KB Dicom File 9/06/2010 3:59 PM
CT.phys01_2 514 KB Dicom File 9/06/2010 3:59 PM
CT.phys01_3 514 KB Dicom File 9/06/2010 3:59 PM
CT.phys01_4 514 KB Dicom File 9/06/2010 3:59 PM
CT.phys01_5 514 KB Dicom File 9/06/2010 3:59 PM
CT.phys01_6 514 KB Dicom File 9/06/2010 3:59 PM
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CT.phys01_25 514 KB Dicom File 9/06/2010 3:59 PM
CT.phys01_26 514 KB Dicom File 9/06/2010 3:59 PM

4.2 UPLOADING DATA FOR REVIEW IN CQMS

Please refer to the CQMS Data Upload Guidelines, available on TROG website www.trog.com.au , Professionals, QA program.